FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid

I. APPLICANT INFORMATION

A. Applicant Name: Paul Johnson

Mailing Address: 8601 US Highway 12

City: Roberts State: MT Zip: 59070

Telephone: 818-825-8611 E-mail: paulj89@hotmail.com

B. Contact Person (if different than applicant): Vanessa Hoene (Great West Engineering)

Address: 6780 Trade Center Ave

City: Billings State: MT Zip: 59101

Telephone: 406-652-5000 E-mail: vhoene@greatwesteng.com

C. Landowner and/or Lessee Name (if different than applicant): See Applicant

Mailing Address:

City: State: Zip:

Telephone: E-mail:

II. PROJECT INFORMATION

A. Project Name: Rock Creek - Irrigation Diversion Improvements

River, stream, or lake: Rock Creek

Location: Township: 5S Range: 21E Section: 16

Latitude: 45.4036 Longitude: -109.1368 *Within project (decimal degrees)*

County: Carbon

B. Purpose of Project:

The irrigation diversion on Rock Creek is at the end of its useful life. The original date of construction is unknown but on-site evidence suggests the diversion was likely constructed between 1950 and 1970 and is comprised of minimally reinforced concrete. The diversion structure is a full "river spanning" structure which provides irrigation flows to the Bangert-Shoff Ditch. The intent of the project is to complete full replacement of the diversion structure with the incorporation of a fish passage component for safe upstream (and downstream) travel.

C. Brief Project Description (attach additional information to end of application):

The existing Johnson Ranch Diversion is located on Rock Creek north of Roberts, Montana at 45° 24'13.07"N, 109° 8'11.99"W. The existing 100’-wide channel-spanning concrete diversion structure is in poor condition and exhibits significant spalling and deterioration. Poor concrete condition threatens the structural integrity of the diversion and increased the likelihood of total structural failure. Significant channel scour is also present upstream and downstream of the diversion structure, which threatens to undermine the structure and further impact the structural integrity of the diversion. The diversion structure also acts as a fish barrier that prevents wild brown trout, rainbow trout and other species from moving upstream to cooler waters during warm summer months when flows in Rock Creek decrease. A significant vertical drop is present between the channel thalweg upstream and downstream of the existing diversion due to the age of the diversion and its effects on channel grade. Fish are largely unable to navigate the significant vertical drop the structure presents, and high velocities on the lower sill of the structure also present a passage barrier.

This project would install a new channel-spanning diversion structure to replace the existing diversion structure that is in poor condition. The upstream control structure would consist of sill rocks on top of footer rocks (all 5’ diameter) which would control flow into the headgate. Downstream of and adjacent to the 80’-wide rock structure, a grouted rock step-pool fishway on the left side of Rock Creek (looking downstream) would allow for fish passage. Adjacent to this fishway, a 3.5’ thick pad of MDT Class III Riprap would provide scour protection at high flows and native channel fill will be placed over the toe of this pad to create a more gradual channel slope. Refer to the project exhibits for more information.

The goal of this project is to work with the private landowner and Montana FWP to replace the Johnson Ranch diversion with a long-term solution that would allow fish passage in Rock Creek during variable flows. This new structure would mitigate the risk of structural failure while improving habitat and fisheries health in Rock Creek.

D. What was the cause of habitat degradation and how will the project correct the cause?

The cause of habitat degradation was the installation of a river spanning diversion structure which effectively functions as a fish barrier with minimal upstream passage potential during most flow regimes. This is due to its configuration with both a vertical drop and concrete apron promoting shallow, laminar and high velocity flow. The replace of this diversion will allow passage throughout most design flows and therefore open up new habitat to and spawning opportunities for wild salmonids and other native species.

E. Length of stream or size of lake that will be treated (project extent): 50 feet (diversion area extents)
Length/size of impact, if larger than project extent (e.g., stream miles opened): 1.5 miles (see IV.B)

F. Project Budget Summary:

Grant Request (Dollars):	**$**	100,000.00
Matching Dollars:	**$**	559,200.00
Matching In-Kind Services:*	**$**	

**salaries of government employees are not considered matching contributions*

Other Contributions (not part of this app)	**$**	
Total Project Cost:	**$**	659,200.00

G. Attach itemized (line item) budget – *see budget template*

H. Attach project location map(s) that include:

- [x] Extent of the project, including context (relation to major landmark or town)
- [x] Indication of public and private property
- [ ] Riparian buffer locations and widths (if applicable) and grazing locations

I. Attach project plans:

- [x] Detailed sketches or plan views with the location and proposed restoration
- [x] Pre-project photographs (GPS location strongly recommended)
- [ ] If water leasing or water salvage is involved, attach a supplemental questionnaire (*https://myfwp.mt.gov/getRepositoryFile?objectID=36110*)

J. Attach letters or statements of support (e.g., landowner consent, community or public support, and fish biologist support). List any other project partners:

See the regional fisheries biologist support letter attached.

III. MAINTENANCE AND MONITORING (attach additional information to end of application):

A. A 20-year maintenance commitment is required*. Please confirm that you will ensure this protection and describe your approach. Attach any relevant maintenance plans. Yes [x] No [ ]
**If it is a water leasing project, describe the length of the agreement.*

As the applicant is the landowner and water rights owner, maintenance will occur to ensure functionality of the diversion, which includes the fish passage component. If selected for funding, the landowner will provide a maintenance agreement to FWP documenting routine maintenance - which is anticipated to be limited and may consist of periodic debris removal.

B. Will grazing be part of or adjacent to the project? If so, describe or attach land management plans, including short term and long term grazing regimes. If the landowner is not the applicant, please describe their involvement in the project. *If you want assistance with grazing plan development, note your need.*

Grazing is not part of the subject project.

C. Will the project be monitored to determine if goals were met? If so, what are the short-term and long-term plans to assess benefits and lessons learned? Were pre-project data collected? Will monitoring information be shared with FWP?

The location of the project site on private land presents challenges to monitoring. FWP has expressed interest in performing monitoring of this project after completion to assess benefits and lessons learned. FWP has previously performed tagging and monitoring of fish at the site but data for these efforts is unavailable. Any monitoring information would be collected by FWP.

IV. PROJECT BENEFITS (attach additional information to end of application):

A. What species of fish will benefit from this project?

Rainbow Trout
Brown Trout
Rocky Mountain Whitefish
Sculpin

B. How will the project protect or enhance wild fish habitat?

The project will enhance wild fish habitat specifically by ensuring upstream passage for general habitat and spawning for another 1.5 miles until the next irrigation diversion structure, which is not channel spanning, but does get all the flow in low flow periods. During higher base flow periods, access could occur for another 18 river miles until the next full river spanning diversion. Refer to primary Rock Creek diversion structure maps attached to the design memorandum.

According to the local fisheries biologist, another important component of allowing upstream passage at lower flows is allowing fish to travel upstream to seek refuge in cooler, spring fed waters, as flows in this reach can become very low during drought or high irrigation demand periods, typically in August-September.

C. What is the expected improvement to fish populations, both short term and long term? How might the project translate to angler success?

The project is expected to increase the viability of fish populations by allowing passage to downstream populations access to an additional minimum of 1.5 accessible river miles for habitat, spawning and refuge during low and warmer water periods. During higher base flow periods, access could occur for another 18 river miles until the next full river spanning diversion. It is expected that improvements will be incremental and should translate into higher and more stable fish populations over time.

D. Will the project increase public fishing opportunity for wild fish and, if so, how? Is public fishing allowed onsite? If not, describe how the public would access the project benefits.

Yes, the replacement of the diversion structure will increase fish opportunity for wild fish populations by allowing passage over the diversion structure. Public fishing is not allowed on-site by private property access, but welcomed via fisherman travel within the OHW mark. This project would theoretically open up a minimum of 1.5 river miles of spawning, habitat and cold water refuge for wild and native fish within Rock Creek.

E. Aside from angling, what local or large-scale public benefits will be realized from this project?

This project would theoretically open up a minimum of 1.5 river miles and a maximum of 18 river miles of spawning and habitat for wild and native fish within Rock Creek, depending on periods of fish movement.

F. Will the project interfere with water or property rights of adjacent landowners? (explain):

The replacement of the diversion structure will provide sufficient flows for the adjacent headgate and associated water right. Proposed construction activities and structure will be located either within the OHW mark or within private property.

G. Will the project result in the development of commercial recreational use on the site (including paid access)? Explain:

No development of commercial recreational use is proposed as part of this project.

H. Is this project associated with the reclamation of past mining activity?

This project is not associated with reclamation of past mining activities.

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

V. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: _____ Date: 5/13/2022

Submittal: **Applications must be signed and received on or before November 15 and May 15 to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	FWP Future Fisheries Fish Habitat Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Future Fisheries Coordinator FWPFFIP@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov and send to mmcgree@mt.gov

FWP.MT.GOV

THE **OUTSIDE** IS IN US ALL.

May 11, 2022

Michelle McGree
Future Fisheries Coordinator
1420 E. Sixth Avenue
P.O. Box 200701
Helena, MT 59620

Dear Ms. McGree and the Future Fisheries Committee:

Montana Fish, Wildlife & Parks (FWP) Region 5 office is pleased to have this opportunity to express support for the Johnson Ranch Diversion project for a Future Fisheries grant. FWP has worked closely with Great West Engineering to provide technical support for improving the Johnson Ranch Diversion on Rock Creek to allow fish to pass during annual low flows.

Rock Creek provides a quality year-round wild trout fishery from its headwaters downstream to Roberts, MT. However, Rock Creek experiences low flows and increased water temperatures during the summer and irrigation season downstream of Roberts. These conditions make some habitat downstream of Roberts unsuitable for trout seasonally. Connectivity is vital in streams like Rock Creek where fish need to migrate seasonally to access quality habitat.

The Johnson Ranch Diversion, located approximately four miles downstream of Roberts, impedes trout upstream migration to the colder waters above Roberts during low flows. Improving the diversion to increase fish passage would allow trout to access quality habitat in Rock Creek during annual summer low flows. With annual flows continuing to be below average on Rock Creek, connectivity throughout the system is important to maintain quality wild trout populations.

Funding requested by this grant will help improve the Johnson Ranch Diversion to allow fish passage during low flows on Rock Creek. The work is supported by the regional FWP fisheries biologist, Bryan Giordano. Rock Creek is important for the region as it provides excellent angling opportunities for wild trout to residents and visitors of Billings and Red Lodge, MT. Thank you for considering this application to improve connectivity in Rock Creek and help manage the quality wild trout fishery in Rock Creek.

Sincerely,

Mike Ruggles
FWP Region 5 Regional Supervisor

BUDGET - JOHNSON RANCH DIVERSION - FUTURE FISHERIES PROGRAM APPLICATION

PROJECT COSTS					CONTRIBUTIONS			
WORK ITEMS (Itemize by Category)	**NUMBER OF UNITS**	**UNIT DESCRIPTION***	**COST/UNIT**	**TOTAL COST**	**FUTURE FISHERIES REQUEST**	**MATCH (Cash or Services)****	**OTHER (Not part of this application)**	**TOTAL**
Personnel***								
Preliminary Design	1	Each	$22,000.00	$ 22,000.00		22,000.00		$ 22,000.00
Final Design	1	Each	$26,000.00	$ 26,000.00		26,000.00		$ 26,000.00
Floodplain Permitting/Analysis	1	Each	$40,000.00	$ 40,000.00		40,000.00		$ 40,000.00
Joint Application Permitting	1	Each	$5,000.00	$ 5,000.00		5,000.00		$ 5,000.00
Wetland Delineations	1	Each	$5,500.00	$ 5,500.00		5,500.00		$ 5,500.00
Cultural Resource/Biological Assessments (To Be Determined)	1	Each	$7,500.00	$ 7,500.00		7,500.00		$ 7,500.00
Oversight	1	Each	$30,500.00	$ 30,500.00		30,500.00		$ 30,500.00
				$ -				$ -
			Sub-Total	$ 136,500.00	$ -	$ 136,500.00	$ -	$ 136,500.00
Travel								
Mileage				$ -				$ -
Per diem				$ -				$ -
			Sub-Total	$ -	$ -	$ -	$ -	$ -
Construction Materials****								
Site Demolition Materials and Disposal Fees	1	Each	$40,000.00	$ 40,000.00		40,000.00		$ 40,000.00
Erosion Control & Pollution Control Materials	1	Each	$4,000.00	$ 4,000.00		4,000.00		$ 4,000.00
Dewatering Materials	1	Each	$13,000.00	$ 13,000.00		13,000.00		$ 13,000.00
Furnish and Deliver 3' Dia. Fishway Rock and Grout	200	Cubic Yard	$350.00	$ 70,000.00	70,000.00			$ 70,000.00
Furnish and Deliver 5' Dia. Control Structure Rock	180	Cubic Yard	$380.00	$ 68,400.00	30,000.00	38,400.00		$ 68,400.00
Furnish and Deliver MDT Class III Riprap	230	Cubic Yard	$118.00	$ 27,140.00		27,140.00		$ 27,140.00
Misc. Channel Grading Materials	1	Each	$14,000.00	$ 14,000.00		14,000.00		$ 14,000.00
			Sub-Total	$ 236,540.00	$ 100,000.00	$ 136,540.00	$ -	$ 236,540.00

(Revised 5/13/2022)

BUDGET - JOHNSON RANCH DIVERSION - FUTURE FISHERIES PROGRAM APPLICATION

Equipment, Labor, and Mobilization										
Contingency	1	Each	$88,300.00	$	88,300.00		88,300.00		$	88,300.00
Mobilization	1	Each	$42,400.00	$	42,400.00		42,400.00		$	42,400.00
Inflation to 2023 construction	1	Each	$38,700.00	$	38,700.00		38,700.00		$	38,700.00
Labor	400	Hours	$55.00	$	22,000.00		22,000.00		$	22,000.00
Hydraulic Excavator	180	Hours	$175.00	$	31,500.00		31,500.00		$	31,500.00
Dump Truck	140	Hours	$130.00	$	18,200.00		18,200.00		$	18,200.00
Skid Steer	80	Hours	$100.00	$	8,000.00		8,000.00		$	8,000.00
Pickup Truck	180	Hours	$65.00	$	11,700.00		11,700.00		$	11,700.00
Generator	60	Hours	$55.00	$	3,300.00		3,300.00		$	3,300.00
Compactor	40	Hours	$80.00	$	3,200.00		3,200.00		$	3,200.00
Misc. Additional Tools and Equipment	1	Each	$7,460.00	$	7,460.00		7,460.00		$	7,460.00
Dewatering Pump Rental	3	Weeks	$3,800.00	$	11,400.00		11,400.00		$	11,400.00
			Sub-Total	$	286,160.00	$ -	$ 286,160.00	$ -	$	286,160.00
			TOTALS	$	659,200.00	$ 100,000.00	$ 559,200.00	$ -	$	659,200.00

OTHER REQUIREMENTS:

All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used). Do not use government salaries as match. Describe here or in text.

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a justification or minimum of two competitive bids for the cost of undertaking the project.

****The Review Panel recommends a maximum fencing cost of $1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

Additional details: Refer to additional budget in the memorandum (totals are consistent with this budget).

BUDGET - JOHNSON RANCH DIVERSION - FUTURE FISHERIES PROGRAM APPLICATION

APPLICATION MATCHING CONTRIBUTIONS

(do not include requested funds or contributions not associated with the application)

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
Paul Johnson (Johnson Ranch)	$ -	$ 559,200.00	$ 559,200.00	Y
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ -	$ 559,200.00	$ 559,200.00	

OTHER CONTRIBUTIONS

(contributions not associated with the application)

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ -	$ -	$ -	

MEMORANDUM

Date: May 2022

To: Paul Johnson, J&J Real Properties Stevensville LLC

From: Great West Engineering, Inc.

Subject: Conceptual Design for Johnson Ranch Diversion Improvements

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The purpose of this memorandum is to summarize the conceptual design alternatives for the Johnson Ranch Diversion Improvements project. This conceptual design has been prepared to accompany an application for Montana Fish, Wildlife and Parks Future Fisheries Improvement Program grant funding.

1.0 Project Information

1.1 Background

The Johnson Ranch Diversion is located on Rock Creek north of Roberts, Montana at 45°24'13.07"N, 109° 8'11.99"W. The existing 100'-wide channel-spanning concrete diversion structure is in poor condition and exhibits significant spalling and deterioration. Poor concrete condition threatens the structural integrity of the diversion and increased the likelihood of total structural failure. Significant channel scour is also present upstream and downstream of the diversion structure, which threatens to undermine the structure and further impact the structural integrity of the diversion.

Figure 1 – View of existing concrete headwall, headgate and diversion structure

Figure 2 – View of existing diversion structure and concrete deterioration

The diversion structure also acts as a fish barrier that prevents wild brown trout, rainbow trout and other species from moving upstream to cooler waters during warm summer months when flows in Rock Creek decrease. Fish are unable to navigate the significant vertical drop the structure presents, and high velocities on the lower sill of the structure also present a passage barrier.

Great West Engineering has previously completed the design for a new headgate at the site to replace the old and deteriorating headgate. The work to replace the existing headgate is anticipated to occur in the late summer/fall of 2022. **Error! Not a valid bookmark self-reference.**

1.2 Purpose

The purpose of this project is to replace the deficient concrete diversion structure with a new channel-spanning diversion structure. The original date of construction is unknown but on-site evidence suggests the diversion was likely constructed between 1950 and 1970, is comprised of minimally reinforced concrete and is at the end of its useful life. The new diversion structure will maintain adequate water delivery to the Bangert-Shoff ditch. The new diversion will also provide fish passage primarily for wild rainbow trout and brown trout but also for other native species such as whitefish and sculpin. Removal of the existing diversion structure will eliminate a velocity and height barrier that is preventing wild and native species from upstream habitat, refuge during warm summer months and historic spawning areas. This will improve habitat and fisheries health in Rock Creek.

1.3 Water Rights and Use

The Johnson Diversion supplies a maximum flow rate of 136 cfs to the Bangert-Shoff ditch and the DNRC water right number is 43D 197620-00. The water right is owned by J & J Real Properties Stevensville LLC and is active year-round.

Diverted water flow into the ditch is controlled by an existing 10’ wide x 5’ tall steel slide gate with a concrete headwall. This headgate is anticipated to be replaced in 2022 by a new steel slide gate of the same size. The existing deteriorating concrete headwall will also be replaced.

1.4 Geomorphology and Vegetation

Using topographic and hydraulic survey data and imagery, basic geomorphic and vegetation assessments were completed. The approximate bankfull width of the surveyed reach of Rock Creek is 65 feet. The average channel gradient upstream of the existing diversion is .0067 ft/ft and .0055 ft/ft downstream of the diversion within the surveyed reach. A significant vertical drop between the channel thalweg elevations upstream and downstream of the diversion exists due to the age of the diversion and its effect on channel gradient. Channel substrate is generally comprised of small cobbles. Within the surveyed reach, the channel appears to be a Rosgen D3b channel type with a high width/depth ratio and low to moderate sinuosity.

Existing vegetation in the project area consists primarily of deciduous trees with a variety of shrubs and native grasses within the floodplain.

Figure 3 – View of Rock Creek channel substrate and vegetation (upstream of diversion)

2.0 Project Alternatives

The intent of a new diversion structure at Johnson Ranch is to provide a long-term solution which not only provided adequate irrigation flows but also incorporates fish passage for a variety of flow rates. All alternatives that were evaluated for this project required an element of fish passage in the design. In the initial assessment, a Denil fish ladder retrofitted to the existing diversion was evaluated but did not address the poor condition of the existing diversion structure and was therefore not pursued further. FWP has provided instruction that a new diversion structure would not require an element of boater passage. The following sections summarize the potential alternatives for the Johnson Ranch Diversion.

2.1 Alternative 1: Rock Step Diversion

This alternative would consist of removing the existing concrete diversion and installing a rock step diversion structure. The upstream control would consist of a channel-spanning U-weir rock structure with a bankfull width of approximately 80 feet and a base width of approximately 28 feet. Downstream of the control, six U-weir rock structures with a bankfull width of approximately 65 feet and a base width of approximately 28 feet would be installed for grade control. The vertical drop between each structure would be a maximum of 1 foot to allow for fish passage and each structure would be spaced 50 feet apart. Pools would be constructed between each structure to lower velocities and allow for fish to rest. Refer to the project exhibits for more information.

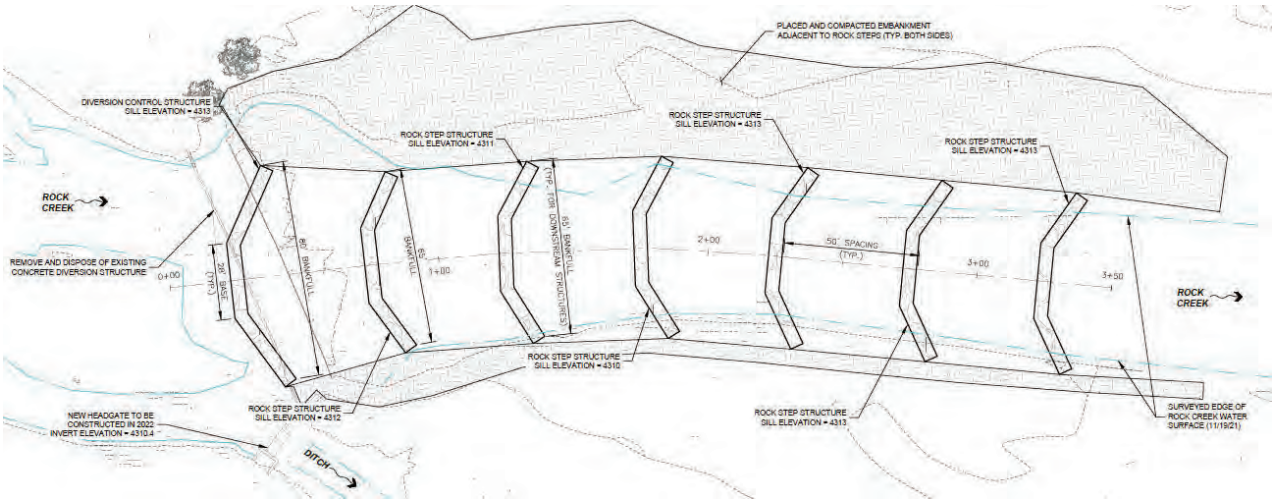


Figure 4 – Plan view of Alternative 1

2.1.1 Pros

- Simple design
- Allows for fish passage during low flows
- Comprised of natural (rock) components with no concrete
- Requires less dewatering than other alternatives
- Improves boater passage on Rock Creek

2.1.2 Cons

- Large footprint
- Large rocks required to withstand shear forces
- Considerable embankment placement into downstream floodplain

2.1.3 Anticipated Project Cost

TABLE 1
OPINION OF PROBABLE COST
JOHNSON RANCH DIVERSION IMPROVEMENTS
ALTERNATIVE 1 - ROCK STEP DIVERSION

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Site Demolition	1	LS	$ 55,000.00	$ 55,000
2	Erosion Control & Pollution Control	1	LS	$ 20,000.00	$ 20,000
3	Dewatering	1	LS	$ 25,000.00	$ 25,000
4	Furnish & Install 5' Dia. Rock	1,000	CY	$ 300.00	$ 300,000
5	Channel Work and Pool Development	1	LS	$ 28,000.00	$ 28,000
6	Embankment Construction & Bank Improvements	1	LS	$ 20,000.00	$ 20,000
	Direct Construction Subtotal				**$ 448,000**
	Mobilization		12%		$ 53,800
	Contingency[3]		25%		$ 112,000
	Construction Subtotal				**$ 613,800**
	2023 Construction Cost [2]		8.0%		$662,900
	Engineering (Design, CA)		15%		$ 99,500
	Joint Application Permitting				$ 5,000
	Wetland Delineations				$ 5,500
	Cultural Resources Survey/Biological Assessments (To Be Determined)				$ 7,500
	Floodplain Permitting and Analysis (Assuming LOMR)				$ 40,000
	TOTAL				**$ 820,400**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] Capital costs are projected to an anticipated construction date in 2023 using a 8.0% inflation rate.

[3] The construction contingency (approximately 25%) was applied to consider potential constructability issues and the potential for unknown factors to arise, such as unforeseen geotechnical conditions or modifications to the structure design once final hydraulics are completed or additional required analysis.

2.2 Alternative 2: Concrete with Ramp

This alternative would consist of removing the existing concrete diversion structure and replacing it with a channel-spanning concrete diversion structure. At the upstream end, a concrete stem wall/footing would control flow into the headgate. Downstream of the 80'-wide concrete wall, a grouted rock step-pool fishway on the left side of Rock Creek (looking downstream) would allow for fish passage. Adjacent to this fishway, a 3.5' thick pad of MDT Class III Riprap would provide scour protection at high flows and native channel fill will be placed over the toe of this pad to create a more gradual channel slope. Refer to the project exhibits for more information.

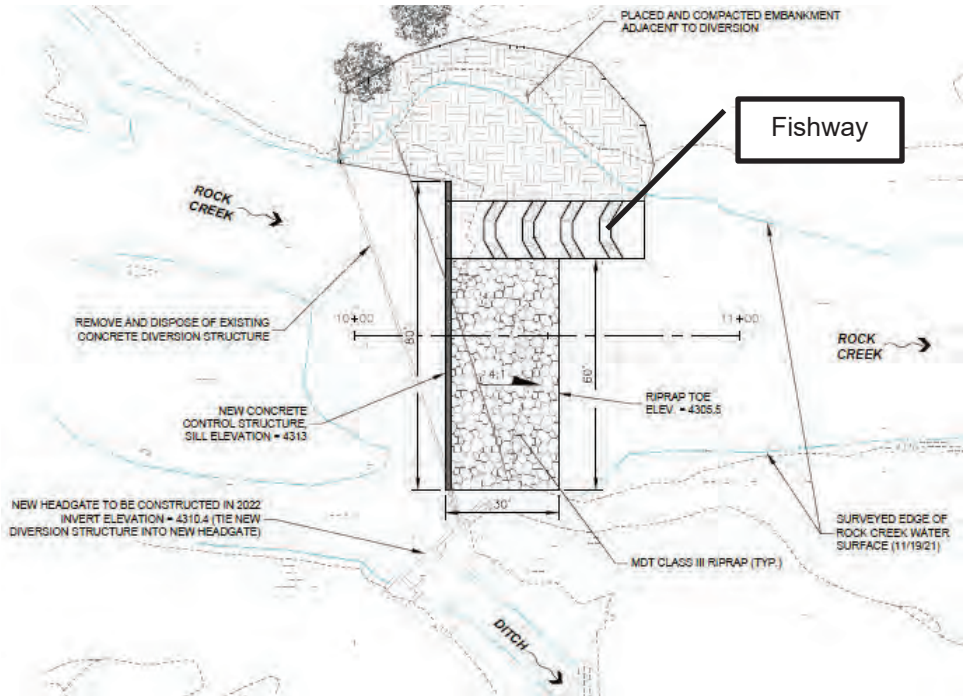


Figure 5 – Plan view of Alternative 2

2.2.1 Pros

- Stable concrete design and ability to tightly control upstream elevations
- Allows for fish passage during variable flows
- Provides scour protection
- Simple connection mechanism at interface between concrete control structure and concrete headwall

2.2.2 Cons

- Hard concrete structure does not allow for future channel migration
- Grout required on fishway to withstand shear forces
- Large riprap required to withstand shear forces
- Concrete at risk of future deterioration

2.2.3 Anticipated Project Cost

TABLE 2
OPINION OF PROBABLE COST
JOHNSON RANCH DIVERSION IMPROVEMENTS
ALTERNATIVE 2 - CONCRETE WITH RAMP

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Site Demolition	1	LS	$ 55,000.00	$ 55,000
2	Erosion Control & Pollution Control	1	LS	$ 5,000.00	$ 5,000
3	Dewatering	1	LS	$ 50,000.00	$ 50,000
4	Furnish & Install Grouted 3' Dia. Fishway Rock	200	CY	$ 500.00	$ 100,000
5	Furnish & Install MDT Class III Riprap	230	CY	$ 250.00	$ 57,500
6	Furnish & Install Cast-in-Place Concrete	78	CY	$ 1,750.00	$ 136,500
7	Miscellaneous Channel Grading & Bank Improvements	1	LS	$ 20,000.00	$ 20,000
	Direct Construction Subtotal				**$ 424,000**
	Mobilization		12%		$ 50,900
	Contingency[3]		25%		$ 106,000
	Construction Subtotal				**$ 580,900**
	2023 Construction Cost [2]		8.0%		$627,400
	Engineering (Design, CA)		15%		$ 94,500
	Joint Application Permitting				$ 5,000
	Wetland Delineations				$ 5,500
	Cultural Resources Survey/Biological Assessments (To Be Determined)				$ 7,500
	Floodplain Permitting and Analysis (Assuming LOMR)				$ 40,000
	TOTAL				$ 779,900

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[2] Capital costs are projected to an anticipated construction date in 2023 using a 8.0% inflation rate.
[3] The construction contingency (approximately 25%) was applied to consider potential constructability issues and the potential for unknown factors to arise, such as unforeseen geotechnical conditions or modifications to the structure design once final hydraulics are completed or additional required analysis.

2.3 Alternative 3: Rock with Ramp

This alternative would consist of removing the existing concrete diversion structure and replacing it with a channel-spanning rock diversion structure. At the upstream end, a rock control structure consisting of sill rocks on top of footer rocks (all 5' diameter) would control flow into the headgate. Downstream of the 80'-wide rock structure, a grouted rock step-pool fishway on the left side of Rock Creek (looking downstream) would allow for fish passage. Adjacent to this fishway, a 3.5' thick pad of MDT Class III Riprap would provide scour protection at high flows and native channel fill will be placed over the toe of this pad to create a more gradual channel slope. Refer to the project exhibits for more information.

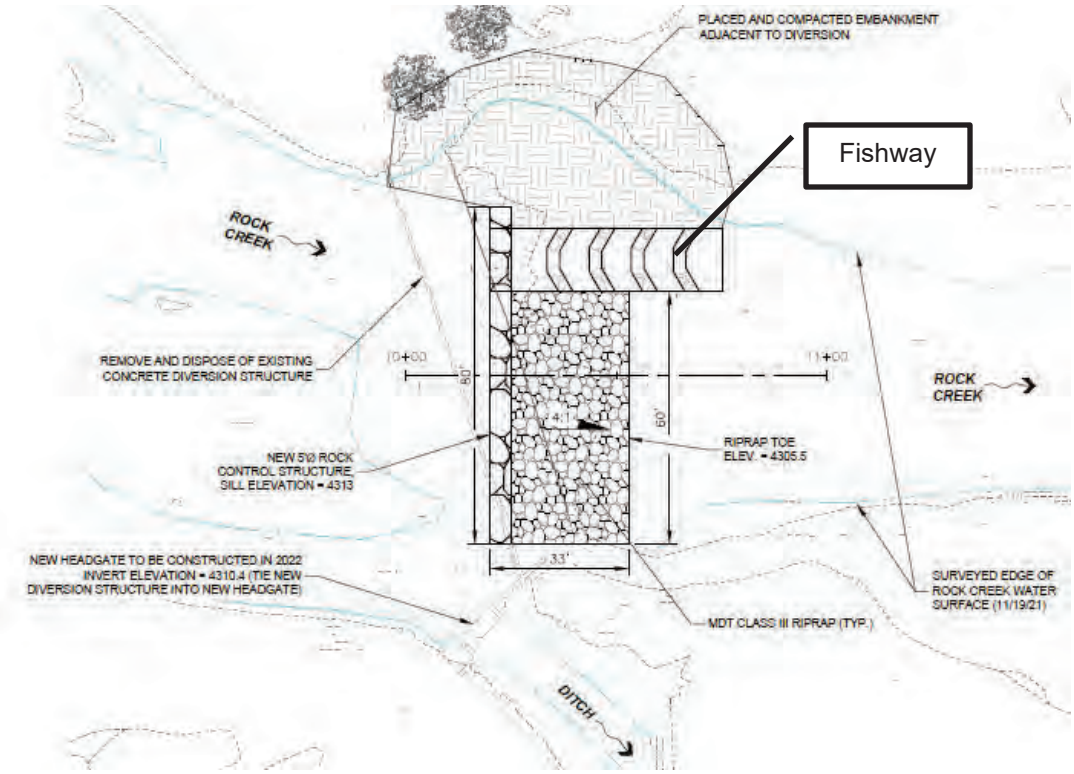


Figure 6 – Plan View of Alternative 3

2.3.1 Pros

- Less costly than Alternative 2
- Allows for fish passage during variable flows
- Provides scour protection
- Stable design using large rocks

2.3.2 Cons

- Grout required on fishway to withstand shear forces
- Large riprap required to withstand shear forces
- More complicated attachment mechanism between rock structure and concrete headwall
- More challenging to tightly control upstream elevations with variable rock configuration

2.3.3 Anticipated Project Cost

TABLE 3
OPINION OF PROBABLE COST
JOHNSON RANCH DIVERSION IMPROVEMENTS
ALTERNATIVE 3 - ROCK WITH RAMP

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Site Demolition	1	LS	$ 55,000.00	$ 55,000
2	Erosion Control & Pollution Control	1	LS	$ 5,000.00	$ 5,000
3	Dewatering	1	LS	$ 25,000.00	$ 25,000
4	Furnish & Install Grouted 3' Dia. Fishway Rock	200	CY	$ 500.00	$ 100,000
5	Furnish & Install 5' Dia. Control Structure Rock	180	CY	$ 600.00	$ 108,000
6	Furnish & Install MDT Class III Riprap	230	CY	$ 175.00	$ 40,250
7	Miscellaneous Channel Grading and Bank Improvements	1	LS	$ 20,000.00	$ 20,000
	Direct Construction Subtotal				**$ 353,300**
	Mobilization		12%		$ 42,400
	Contingency[3]		25%		$ 88,300
	Construction Subtotal				**$ 484,000**
	2023 Construction Cost [2]		8.0%		$522,700
	Engineering (Design, CA)		15%		$ 78,500
	Joint Application Permitting				$ 5,000
	Wetland Delineations				$ 5,500
	Cultural Resources Survey/Biological Assessments (To Be Determined)				$ 7,500
	Floodplain Permitting and Analysis (Assuming LOMR)				$ 40,000
	TOTAL				**$ 659,200**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[2] Capital costs are projected to an anticipated construction date in 2023 using a 8.0% inflation rate.
[3] The construction contingency (approximately 25%) was applied to consider potential constructability issues and the potential for unknown factors to arise, such as unforeseen geotechnical conditions or modifications to the structure design once final hydraulics are completed or additional required analysis.

2.4 Hydraulics

For the conceptual analysis of project alternatives, the 100-year flood event was used for rock sizing and average flows in June-October were used for low flow passage analysis. A two-dimensional hydraulic model was created for the project using HEC-RAS software, Version 6.1. Table 4 below summarizes hydraulic properties for existing conditions and Table 5 summarizes estimated hydraulic properties of the different alternatives. The 100-year flow was obtained from the updated hydrology used in the most recent Carbon County Flood Insurance Study. The monthly flows in the table are the mean flow rates for each month obtained using the USGS StreamStats application. Values reported in the table represent values at the upstream control for each alternative.

Table 4 – Existing Conditions Hydraulics

Flow Event	Flow (CFS)	Existing Conditions	
		WSE	Control Velocity (ft/s)
100-year	3620	4317.61	7.13
July	322	4314.01	3.84
August	127	4313.49	2.20
September	94.1	4313.38	1.81
October	86.9	4313.34	1.33

Table 5 – Estimated Hydraulics for Project Alternatives

Flow Event	Flow (CFS)	Alternative 1		Alternative 2		Alternative 3	
		WSE	Average Control Velocity (ft/s)	WSE	Average Control Velocity (ft/s)	WSE	Average Control Velocity (ft/s)
100-year	3620	4317.57	6.59	4317.47	6.58	4317.21	6.70
July	322	4314.61	2.86	4313.85	3.80	4313.88	3.59
August	127	4314.00	2.17	4313.24	3.22	4313.28	2.87
September	94.1	4313.85	1.97	4313.11	2.96	4313.15	2.29
October	86.9	4313.80	1.76	4313.08	2.63	4313.13	1.71

Water surface elevations at the 100-year and at low flows do not significantly differ from existing conditions and it is not anticipated that the alternatives would negatively impact the ability of the ditch to receive the necessary flow rate. All three alternatives have a lower control velocity than the existing diversion, which serves to improve fish passage. At low flows, the estimated velocities for all three alternatives are considered passable. At high flows, these alternatives have lower control velocities than the existing diversion and will improve fish passage.

2.5 Cost Benefit Analysis and Preferred Alternative

The natural resource benefits of all three project alternatives are similar in that they all provide fish passage for a variety of flows. Regardless of which alternative is installed, wild rainbow and brown trout, along with other native species will be able to pass upstream in Rock Creek to cooler waters when flows decrease. This will serve to improve habitat and fish health in Rock Creek. Alternative 2 and Alternative 3 provide similar natural resource benefits at a lower cost and smaller footprint than Alternative 1. Alternative 3 is less costly than Alternative 2 and the lack of concrete in Alternative 3 reduces the risk of future deterioration. For these reasons, Alternative 3 is the preferred alternative.

3.0 Implementation

3.1 Project Tasks

This project is currently in the conceptual design and grant application stage in an attempt to secure funding for future phases. If funding is secured, final design will occur in which full construction plans, specifications, and cost estimate will be prepared. The design would be reviewed and approved by the Landowner as well as other project stakeholders, including but not limited to Montana Fish, Wildlife & Parks (FWP).

After the design is finalized, bidding and permitting of the project will occur. It is anticipated that the project will require a United States Army Corps of Engineers (USACE) Section 404 permit, a FWP 124 permit, DEQ 318 authorization and a floodplain permit from Carbon County. Currently, the project is in a Zone A floodplain. Updated flood maps are anticipated to become effective in 2024, at which point the project would be in a Zone AE floodplain and would likely require a letter of map revision (LOMR) to be approved. It is possible that updated flood maps would become effective prior to the anticipated date, so costs for a LOMR have been incorporated into project estimates to be conservative. A project manual with bidding documents and technical specifications will be developed for a public bidding process to select a contractor.

Once bidding and permitting is complete, the construction phase will occur. It is anticipated that construction would happen in one season over the course of approximately two months. Construction phases will include mobilization, clearing and grubbing, dewatering, diversion installation, channel grading and project cleanup. After construction is complete, project closeout will occur. During this phase, a final walkthrough with the Engineer, Contractor, Landowner and other project stakeholders will occur to ensure the work has been completed as specified. As-built plans will be prepared and final payment will be issued.

3.2 Project Schedule

- Grant Award: Summer 2022
- Final Design: Fall/Winter 2022
- Permitting and Bidding: Winter/Spring 2023
- Construction: Summer 2023
- Closeout: Summer/Fall 2023

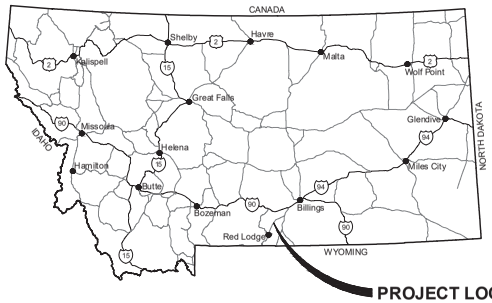
4.0 Attachments

- Exhibits
- Site Photos
- Land Ownership Map

EXHIBIT INDEX

PROJECT: 2-21112

DATE: MAY 2022



JOHNSON RANCH DIVERSION IMPROVEMENTS

FUTURE FISHERIES GRANT APPLICATION - EXHIBITS

SECTION 16, TOWNSHIP 5 SOUTH, AND RANGE 21 EAST

NOT TO SCALE

GreatWest ENGINEERING
2501 BELT VIEW DRIVE
HELENA, MT 59601
(406)449-8627

NO.	REVISION DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			
6			

SET NO.

EXHIBIT NO.

1

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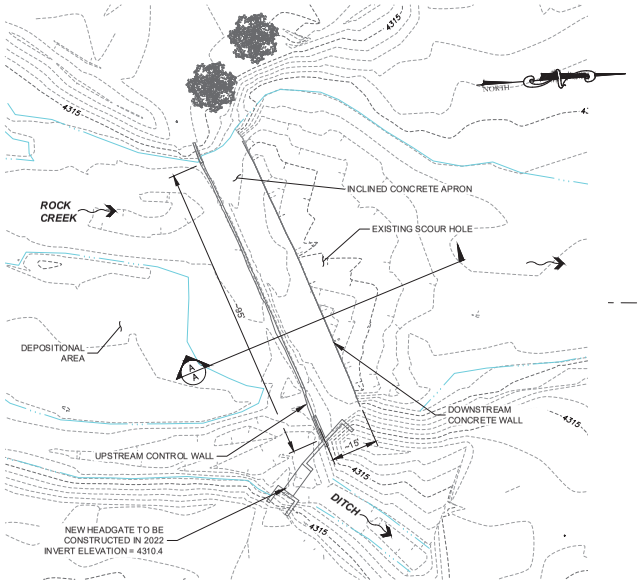

EXISTING SITE MAP

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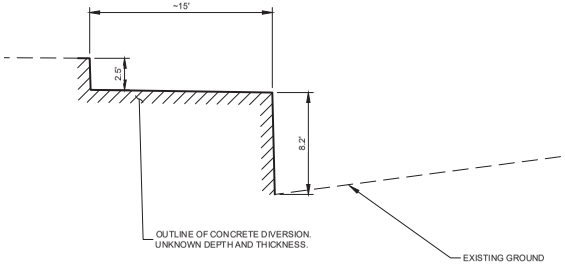

EXISTING DIVERSION SECTION A-A

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OVERALL VIEW OF EXISTING DIVERSION STRUCTURE

SIDE VIEW OF EXISTING DIVERSION STRUCTURE

PANORAMIC VIEW OF EXISTING DIVERSION STRUCTURE AND HEADGATE

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Exhibit 2
Existing Site Map & Photos

JOHNSON RANCH DIVERSION IMPROVEMENTS

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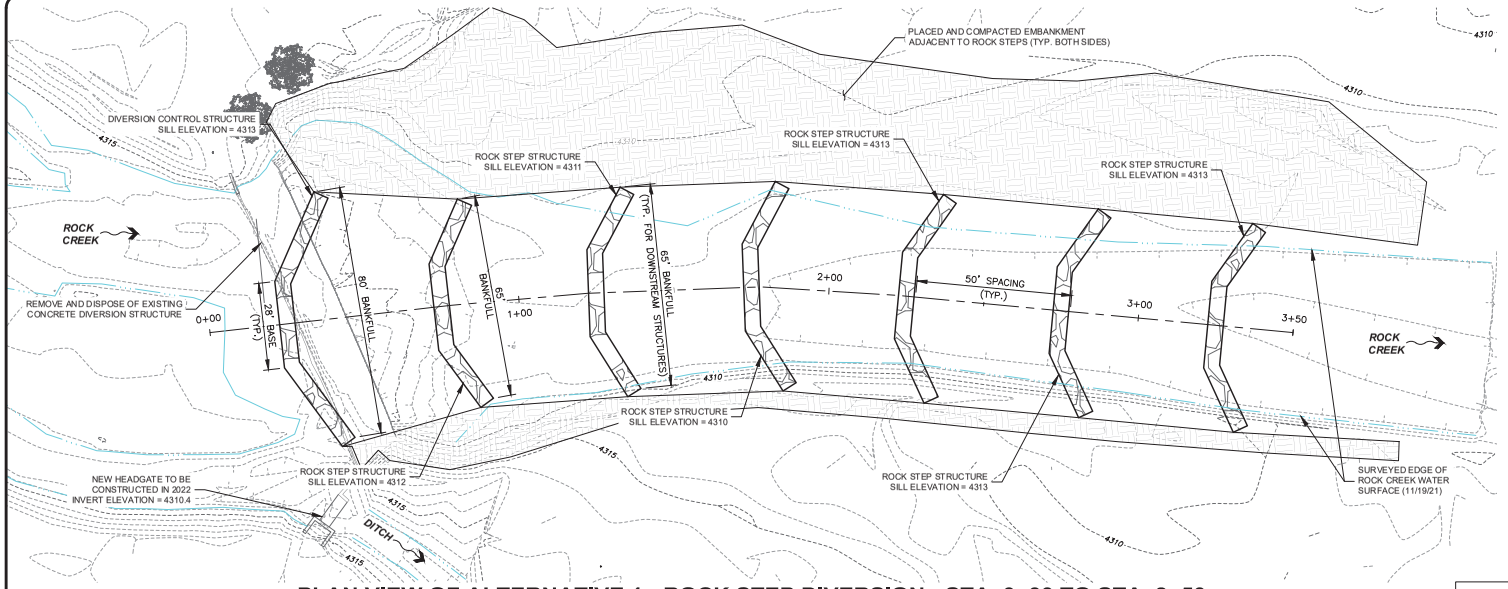

PLAN VIEW OF ALTERNATIVE 1 - ROCK STEP DIVERSION - STA. 0+00 TO STA. 3+50

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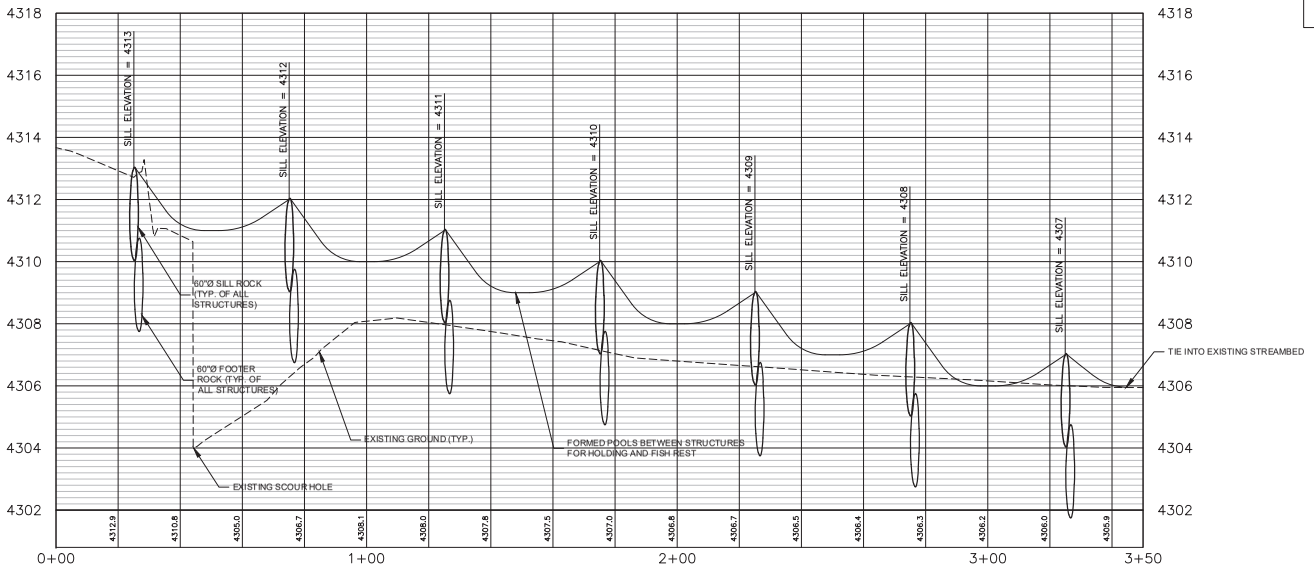
SCALE IN FEET



PROFILE VIEW OF ALTERNATIVE 1 - ROCK STEP DIVERSION - STA. 0+00 TO STA. 3+50

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 4'

NOTE: SHOWN CONFIGURATION, DIMENSIONS AND ELEVATIONS OF INFRASTRUCTURE IS INTENDED FOR CONCEPTUAL VISUALIZATION ONLY. ACTUAL CONFIGURATION, DIMENSIONS AND ELEVATIONS OF FINAL DESIGN MAY DIFFER FROM WHAT IS SHOWN ON THESE EXHIBITS DEPENDING ON FINAL DESIGN CRITERIA.

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Exhibit 3
Alternative 1 - Rock Step Diversion Plan & Profile

JOHNSON RANCH DIVERSION IMPROVEMENTS

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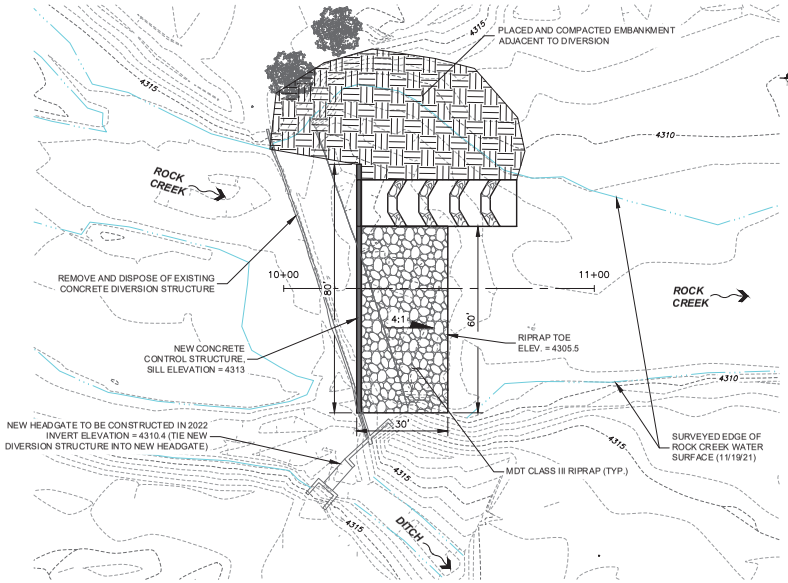

PLAN VIEW OF ALTERNATIVE 2 - CONCRETE WITH RAMP - STA. 10+00 TO STA. 11+00

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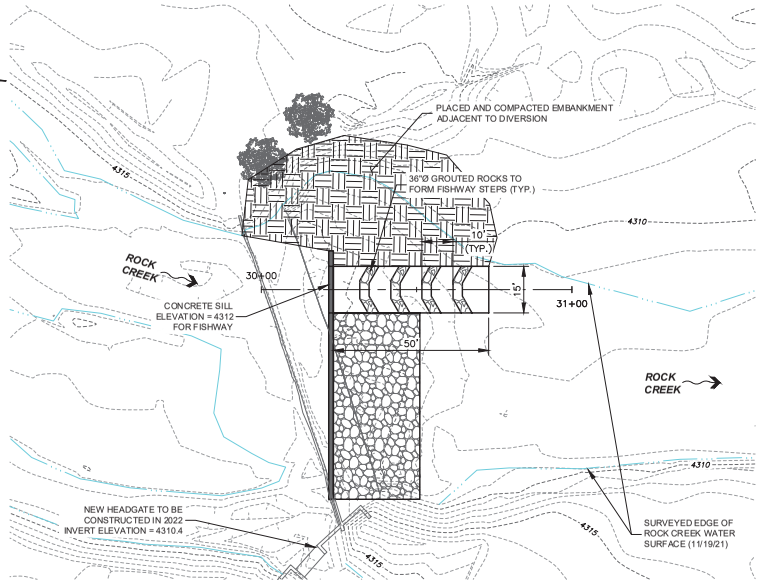
SCALE IN FEET



PLAN VIEW OF FISHWAY - STA. 30+00 TO STA. 31+00

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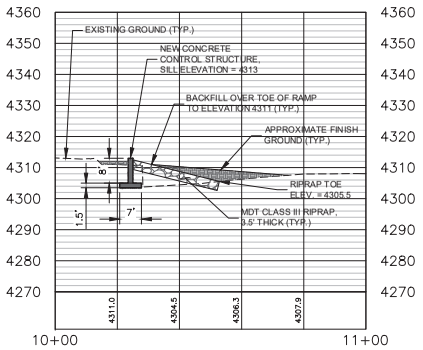
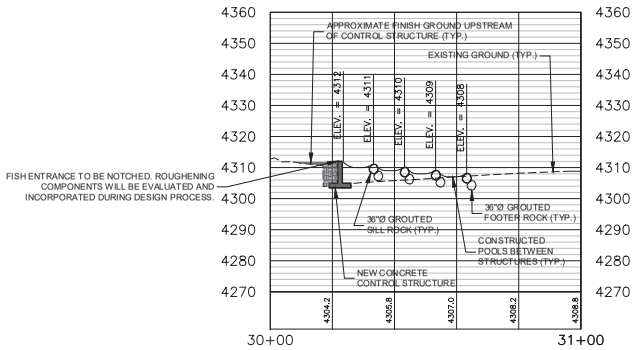
SCALE IN FEET



PROFILE VIEW OF ALTERNATIVE 2 - CONCRETE WITH RAMP - STA. 10+00 TO STA. 11+00

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 40'



PROFILE VIEW OF FISHWAY - STA. 30+00 TO STA. 31+00

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 40'

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NOTE: SHOWN CONFIGURATION, DIMENSIONS AND ELEVATIONS OF INFRASTRUCTURE IS INTENDED FOR CONCEPTUAL VISUALIZATION ONLY. ACTUAL CONFIGURATION, DIMENSIONS AND ELEVATIONS OF FINAL DESIGN MAY DIFFER FROM WHAT IS SHOWN ON THESE EXHIBITS DEPENDING ON FINAL DESIGN CRITERIA.

Exhibit 4
Alternative 2 - Concrete with Ramp
Plan & Profile

JOHNSON RANCH DIVERSION IMPROVEMENTS

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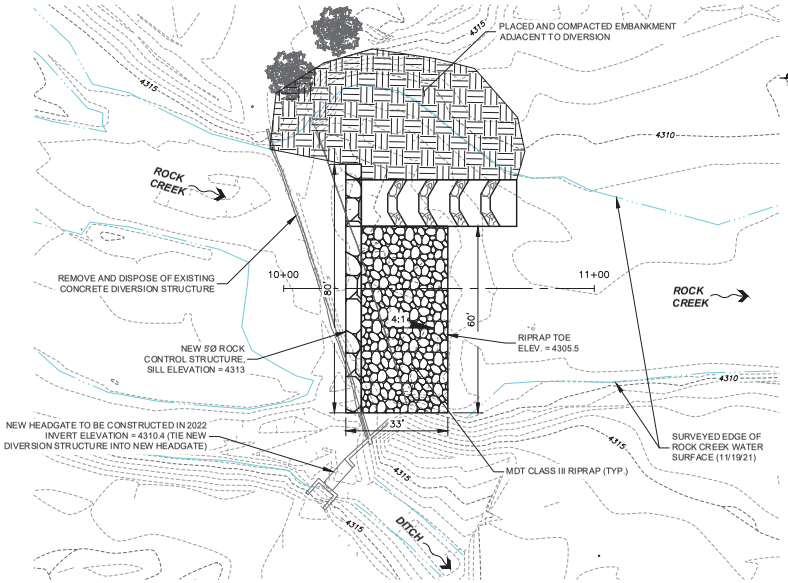

PLAN VIEW OF ALTERNATIVE 3 - ROCK WITH RAMP - STA. 10+00 TO STA. 11+00

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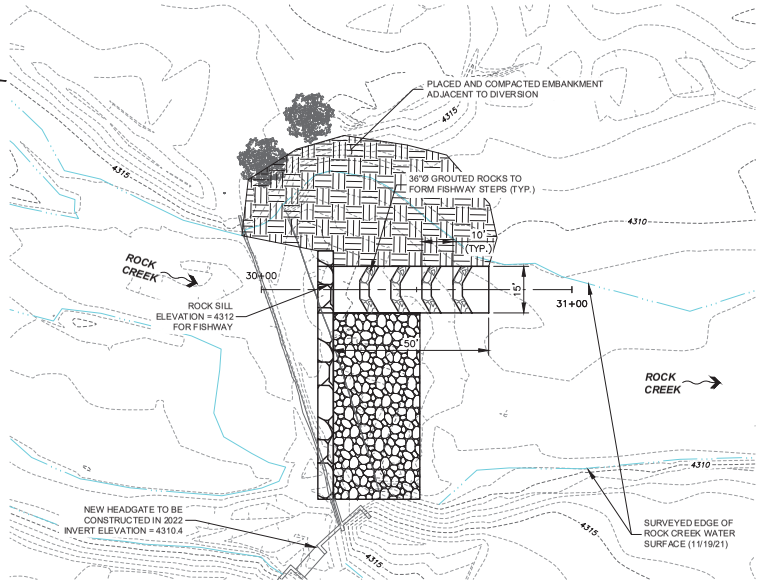
SCALE IN FEET



PLAN VIEW OF FISHWAY - STA. 30+00 TO STA. 31+00

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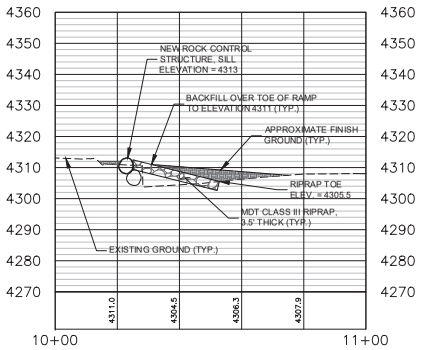
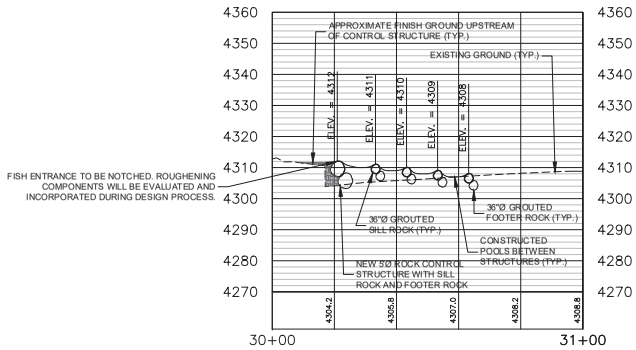
SCALE IN FEET



PROFILE VIEW OF ALTERNATIVE 3 - ROCK WITH RAMP - STA. 10+00 TO STA. 11+00

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 40'



PROFILE VIEW OF FISHWAY - STA. 30+00 TO STA. 31+00

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 40'

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Exhibit 5
Alternative 3 - Rock with Ramp
Plan & Profile

JOHNSON RANCH DIVERSION IMPROVEMENTS

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Project Name:	**Johnson Ranch Diversion**	Rock Creek diversion improvements	021-2022

SITE PHOTOS

View of Existing Diversion Structure

View of Existing Headate and Diversion Structure

SITE PHOTOS

Panoramic View of Existing Diversion and Headgate Structure

View of Control of Diversion Structure.

SITE PHOTOS

View of diversion structure from downstream looking upstream.

Another view of diversion structure from downstream.

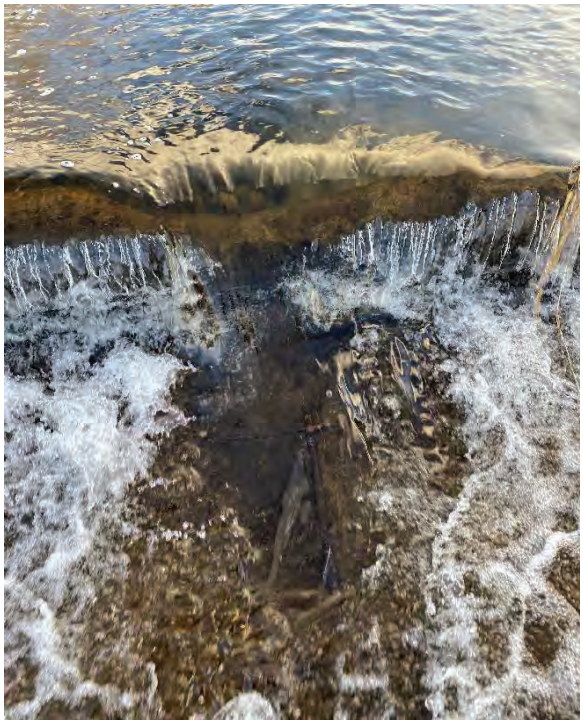
SITE PHOTOS

View of upstream and pad of diversion structure. Note shallow, laminar flow.

View of concrete cracking and deterioration, typical throughout.

SITE PHOTOS

View looking along upper control of existing diversion.



View of concrete deterioration and exposed rebar in diversion structure.

SITE PHOTOS

View of Rock Creek channel upstream of diversion.

View of Rock Creek channel downstream of diversion.

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LAND OWNERSHIP MAP

NTS - APPROXIMATE ONLY

JOHNSON RANCH DIVERSION

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